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Leong

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(54) **INTELLIGENT PACKET SLICING**

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This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

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(51) **Int. Cl.**
H04J 3/24 (2006.01)
H04L 29/06 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 69/04*** (2013.01); *H04L 69/22* (2013.01)

(58) **Field of Classification Search**
USPC 370/351–476
See application file for complete search history.

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Notice of Allowance and Fee(s) Due dated May 3, 2012, for U.S. Appl. No. 12/327,756.

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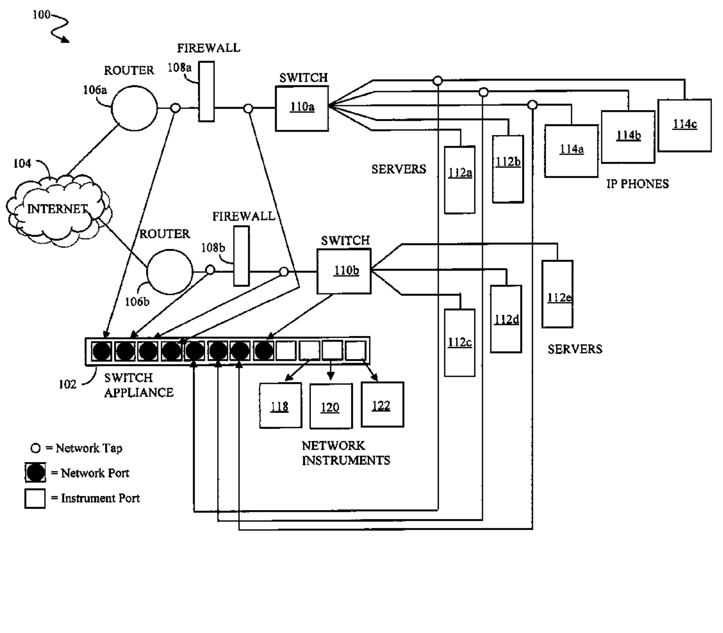
Assistant Examiner — Juvena Loo
(74) *Attorney, Agent, or Firm* — Vista IP Law Group, LLP

(57) **ABSTRACT**

Packets can be intelligently sliced by removing irrelevant portions of a packet, while retaining relevant portions. For a series of network packets, a packet is obtained from the network. The packet includes at least a header, one or more packet fields, and a first data payload. The protocol of the packet is determined. Once the protocol is known, the packet header is parsed to determine the position of the first data payload. Based on the determine positions of the first data payload, a modified packet is created by removing or masking the first data payload.

26 Claims, 7 Drawing Sheets



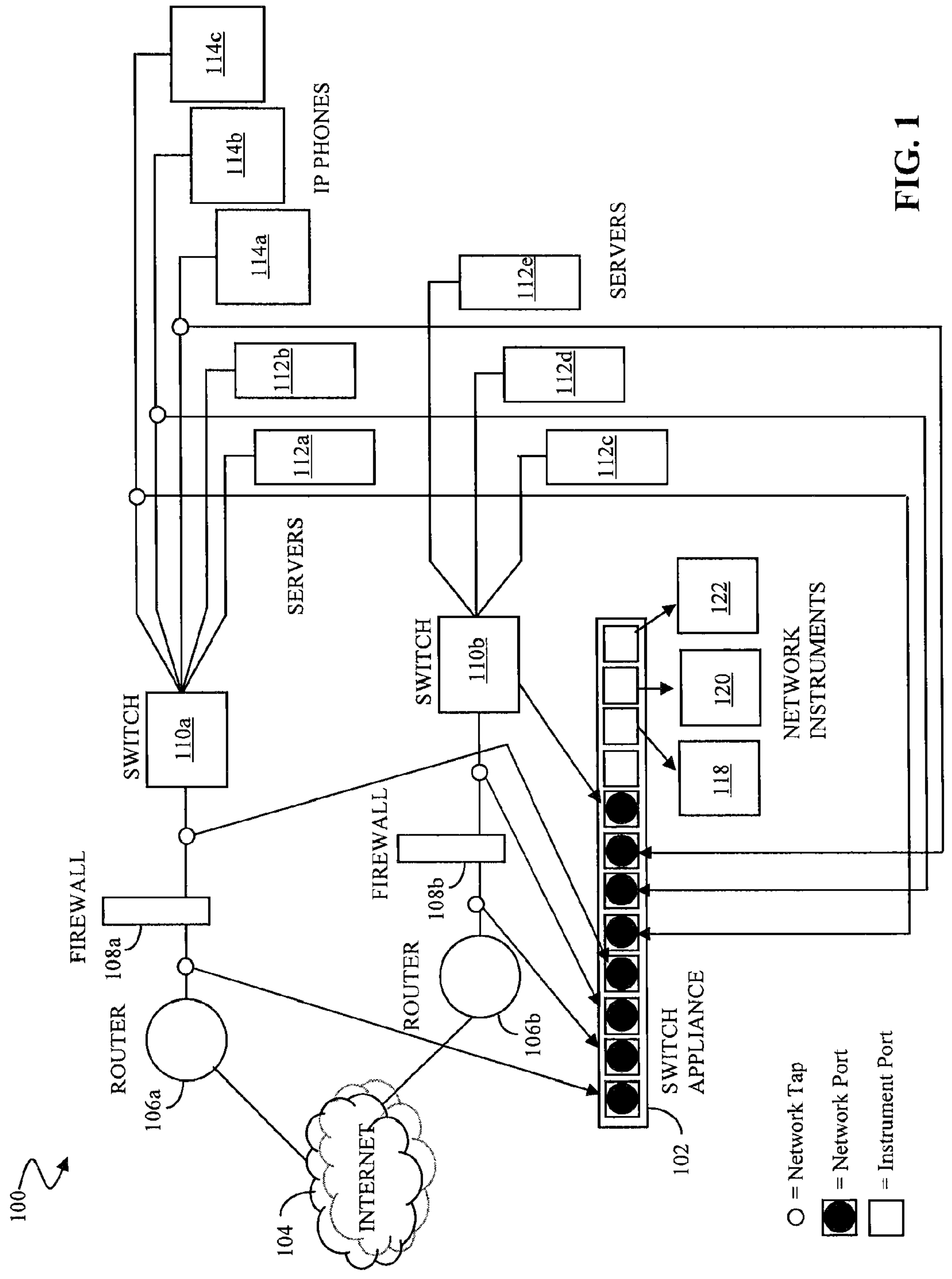

100
104
INTERNET
ROUTER
106a
ROUTER
106b
FIREWALL
108a
FIREWALL
108b
SWITCH
110a
SWITCH
110b
SERVERS
112a
112b
112c
112d
112e
SERVERS
114a
114b
114c
IP PHONES
102
SWITCH APPLIANCE
118
120
122
NETWORK INSTRUMENTS
○ = Network Tap
● = Network Port
□ = Instrument Port

FIG. 1

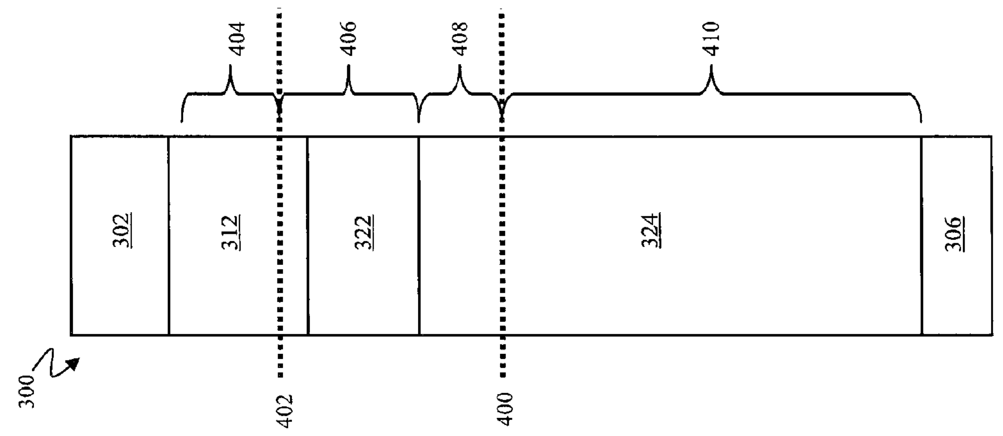


FIG. 4

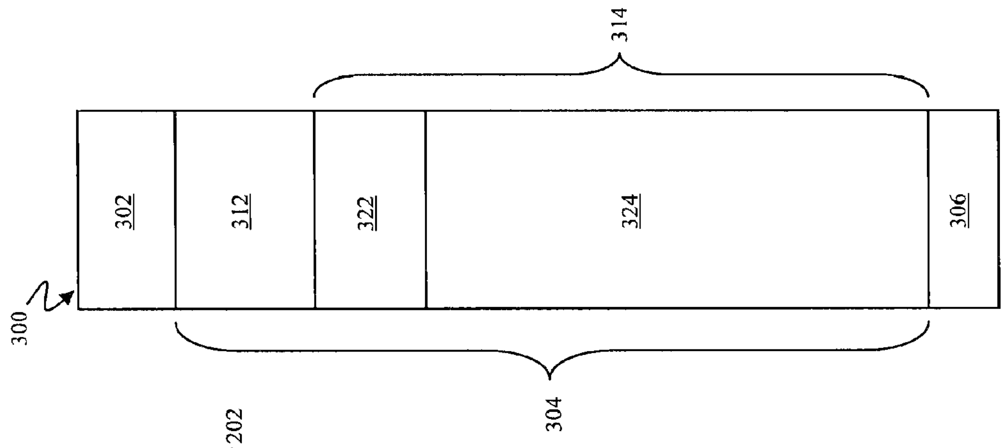


FIG. 3

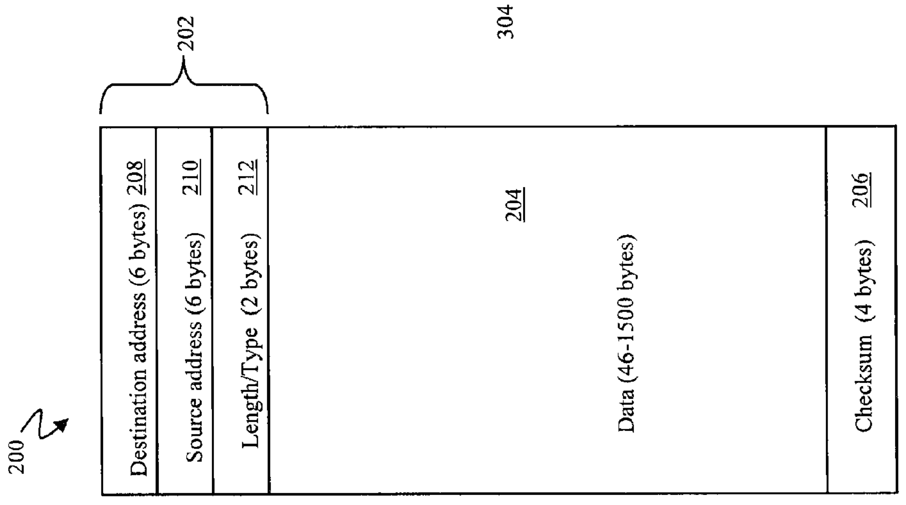

200
202
Destination address (6 bytes) 208
Source address (6 bytes) 210
Length/Type (2 bytes) 212
204
Data (46-1500 bytes)
Checksum (4 bytes) 206

FIG. 2

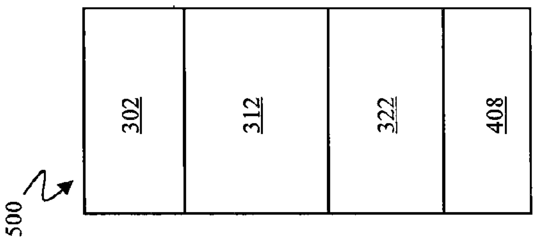


FIG. 5

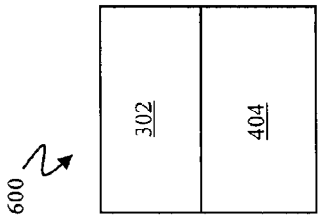
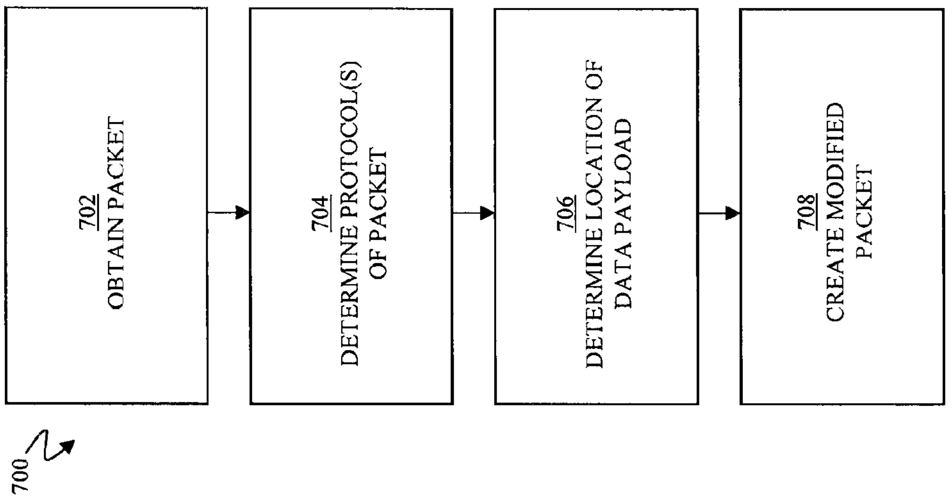


FIG. 6


700
702 OBTAIN PACKET
704 DETERMINE PROTOCOL(S) OF PACKET
706 DETERMINE LOCATION OF DATA PAYLOAD
708 CREATE MODIFIED PACKET
FIG. 7

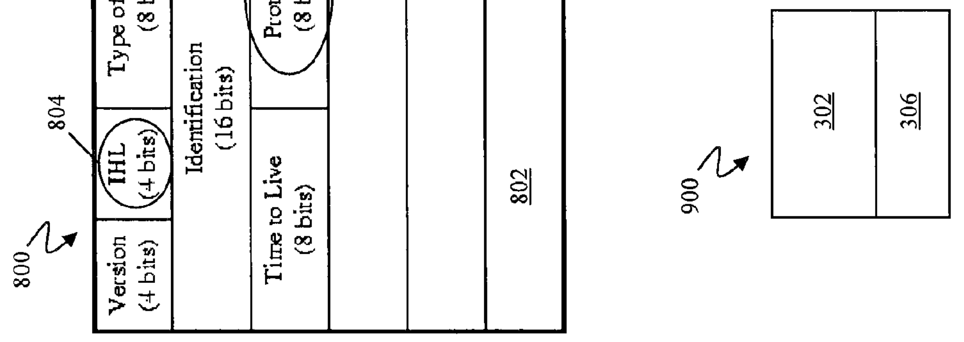


FIG. 9

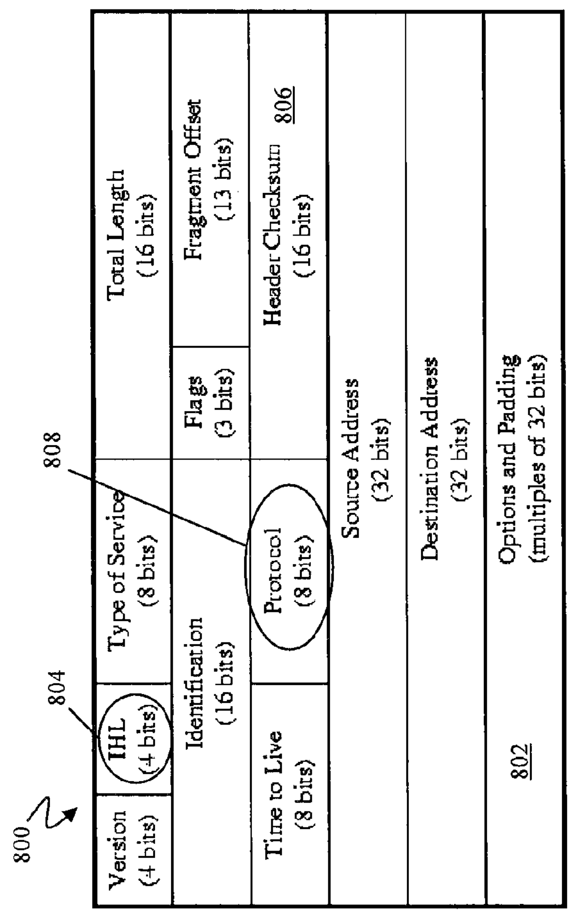


FIG. 8

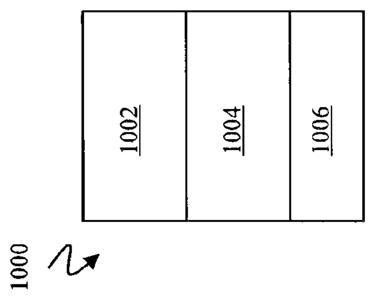


FIG. 10

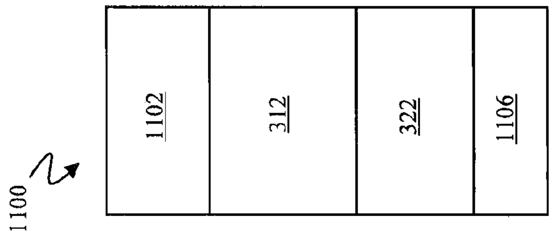


FIG. 11

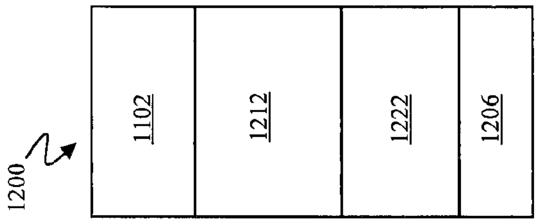


FIG. 12

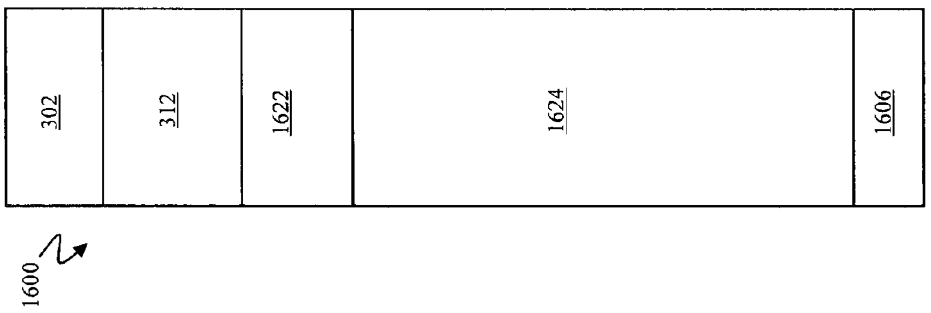


FIG. 16

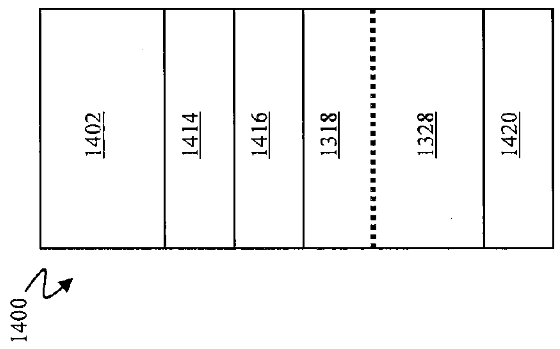


FIG. 14

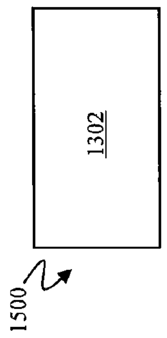


FIG. 15

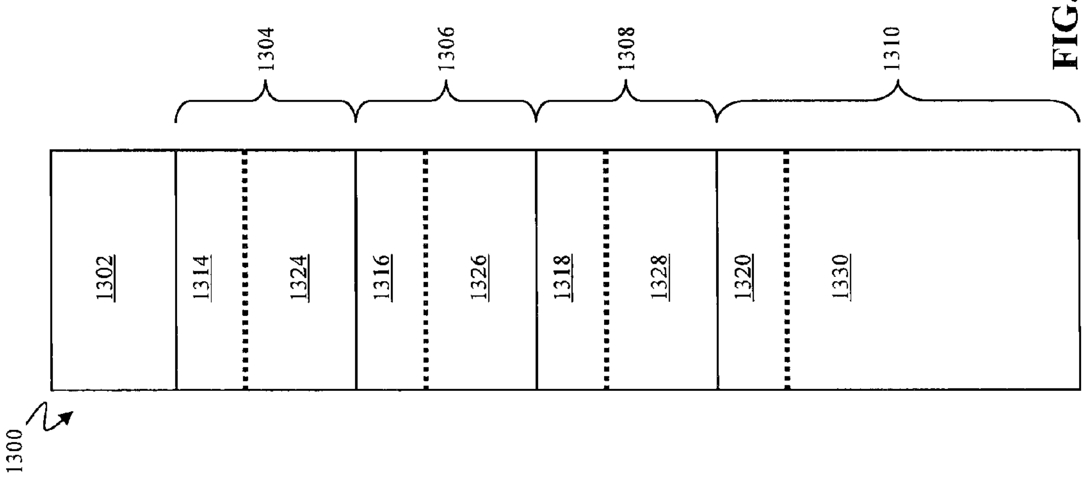


FIG. 13

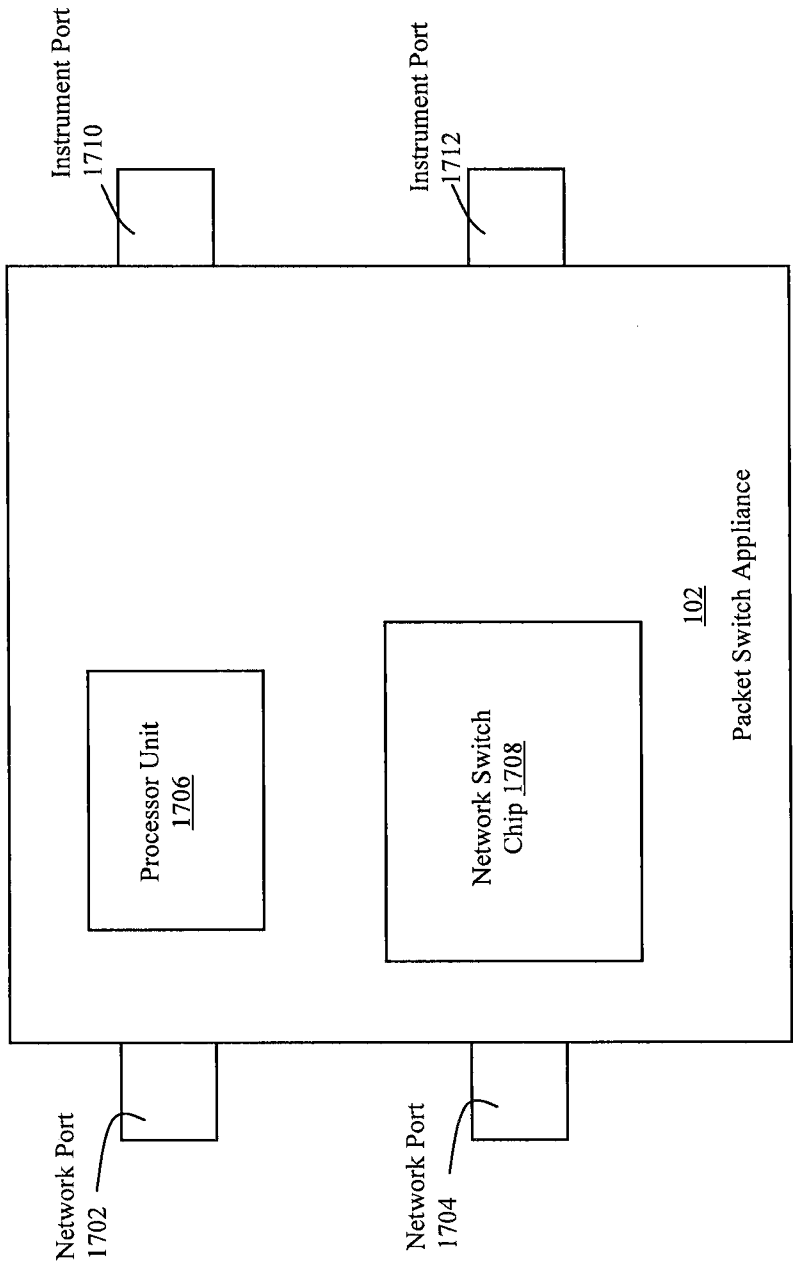

Instrument Port 1710
Instrument Port 1712
Processor Unit 1706
Network Switch Chip 1708
102 Packet Switch Appliance
Network Port 1702
Network Port 1704

FIG. 17

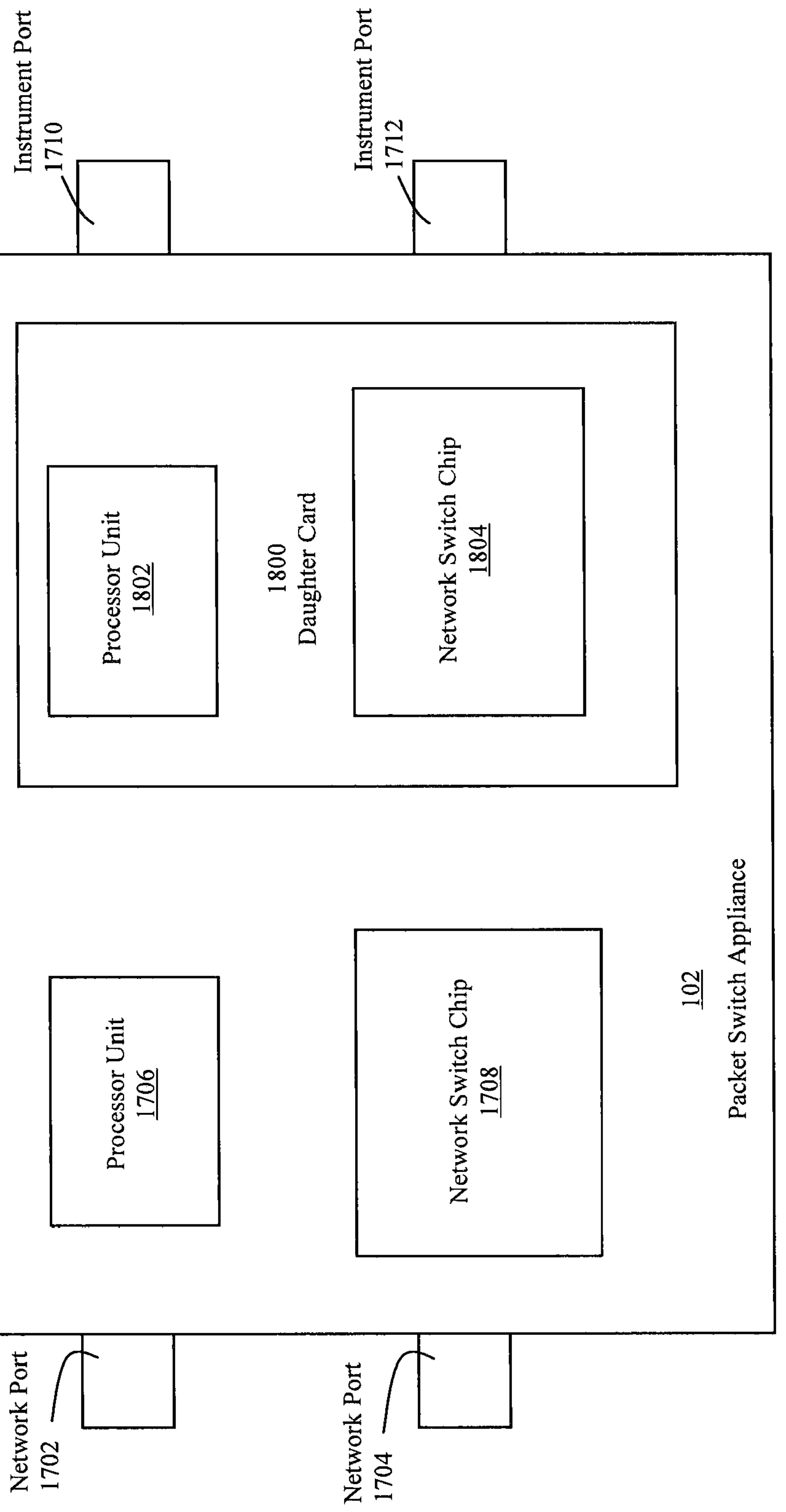

Instrument Port
1710
Instrument Port
1712
Processor Unit
1802
1800
Daughter Card
Network Switch Chip
1804
Processor Unit
1706
Network Switch Chip
1708
102
Packet Switch Appliance
Network Port
1702
Network Port
1704

FIG. 18

INTELLIGENT PACKET SLICING

RELATED APPLICATION DATA

This application is a continuation of U.S. patent application Ser. No. 12/327,756, filed Dec. 3, 2008, pending, the entire disclosure of which is expressly incorporated by reference herein.

BACKGROUND

1. Field

This application generally relates to packet networks and more specifically to intelligently slicing packets obtained from packet networks.

2. Related Art

In a typical data network, data is transmitted as packets. A packet generally has a header and a data payload.

Typically, the contents of the packet header may include several fields containing information about the contents, size, source, destination, checksum, and type of packet. Occasionally, the end of a packet also contains a field. For example, the 802.3 Ethernet standard specifies that a packet checksum is located in the final four bytes of an Ethernet packet. The format, size, and content of a packet header depend largely on the protocol of the packet. The packet data payload contains the data message that is being transmitted. Alternatively, a second packet can be layered within the data payload of a first packet.

When network problems occur, such as dropped packets, excessive lag, or low throughput, information contained in packet headers can be used to aid the diagnosis of the problem. Often, a large number of packets are needed to diagnose a problem fully. Therefore, storage of packets is often useful to enable later analysis and inspection. Additionally, a network professional is typically required to analyze the packets. The network specialist will often be off site from the network. Again, this requires that the packets be stored and transmitted to the network professional for inspection and analysis.

Networks often span a very large physical area. When a problem occurs, localizing the problem to a specific area may be difficult. Therefore, transmitting packets from locations all over the network to a central location for storage and analysis is often desirable.

While a single packet is typically small, storing a very large number of packets can quickly burden a storage device. Additionally, retransmission of packets from locations all over the network to the storage location can significantly affect bandwidth of the network. The most relevant portions of a packet for problem diagnosis, the headers, are generally a small fraction of the overall packet size. Therefore, to conserve bandwidth and reduce storage requirements, packet slicing devices can remove irrelevant portions of the packet prior to retransmission and storage.

However, conventional packet slicing techniques are based on slicing at a fixed offset regardless of the protocol, size, or contents of a packet. Therefore, often relevant portions are lost or irrelevant portions are retained.

SUMMARY

In an embodiment, a packet is obtained from a series of packets. The packet contains at least a packet header, one or more packet fields, and a first data payload. The series of packets uses one or more protocols. After obtaining the packet, one or more protocols of the obtained packet are determined. After determining the one or more protocols of the packet, the packet header is parsed to determine the position of the first data payload. Next, a modified packet is created by removing or masking the first data payload based on the determined location of the first data payload. This procedure of determining the protocol(s), parsing the header, and creating a modified packet is repeated for each packet in the series of packets.

DESCRIPTION OF DRAWING FIGURES

The present application can be best understood by reference to the following description taken in conjunction with the accompanying drawing figures, in which like parts my be referred to by the like numerals:

FIG. **1** illustrates an exemplary computer network;

FIG. **2** illustrates an Ethernet packet;

FIG. **3** illustrates a network packet having layers 2-4;

FIG. **4** illustrates positions of potential fixed offsets for conventional packet slicing;

FIG. **5** illustrates the sliced packet resulting from a fixed offset that is too large;

FIG. **6** illustrates the sliced packet resulting from a fixed offset that is too small;

FIG. **7** illustrates an exemplary process of intelligent packet slicing;

FIG. **8** illustrates a layout of an IP packet header according to the IP specification;

FIG. **9** illustrates a modified packet;

FIG. **10** illustrates a second modified packet;

FIG. **11** illustrates a third modified packet;

FIG. **12** illustrates a fourth modified packet;

FIG. **13** illustrates an exemplary SCTP packet;

FIG. **14** illustrates a modified SCTP packet;

FIG. **15** illustrates a second modified SCTP packet;

FIG. **16** illustrates a modified packet created by masking out the data payload;

FIG. **17** illustrates an embodiment of a packet switch appliance; and

FIG. **18** illustrates an embodiment of a packet switch appliance with a daughter card component.

DETAILED DESCRIPTION

The following description sets forth numerous specific configurations, parameters, and the like. It should be recognized, however, that such description is not intended as a limitation on the scope of the present invention but is instead provided as a description of exemplary embodiments.

With reference to FIG. **1**, a packet switch appliance **102** is integrated with packet network **100**. Internet **104** is connected via routers **106***a* and **106***b* and firewalls **108***a* and **108***b* to switches **110***a* and **110***b*. Switch **110***a* is also connected to servers **112***a* and **112***b* and to IP phones **114***a*, **114***b*, and **114***c*. Switch **110***b* is also connected to server **112***c-e*. The packet switch appliance **102** is connected to various point of the network via network taps and tap ports on the packet switch device. Packet switch appliance **102** is also connected to a variety of network instruments **118**, **120**, and **122** for monitoring network-wide packet traffic. These network instruments include but are not limited to: packet sniffers, intrusion detection system, and forensic recorder. In alternate embodiments, a packet switch appliance may include fewer components or more components, than those depicted.

As depicted in FIG. **1**, because packet switch appliance **102** is connected to every device in the packet network, the packet switch appliance has a global network footprint and may potentially access all data packets transmitted across the network. Consequently, through its various network ports, packet switch appliance **102** can potentially access packets from anywhere throughout the network.

As discussed earlier, when problems occur with network **100**, the information contained within packet headers can be useful in diagnosing the problems. Storage of a large number of packets may be required to diagnose the problem fully. Additionally, because of the global footprint of the network, packets may be transmitted from locations all over the world. The retransmission and storage of the packets will potentially burden the network and storage device. Therefore, slicing the packets to remove portions can ease the burdens caused by retransmission and storage. Packets can also be sliced to limit the visibility of the contents of the packets, such as sensitive or confidential information contained in the data payload of packets.

The Open Systems Interconnections Reference Model (OSI Model) is an abstract description for layered communications and network protocol design. The OSI Model defines layers 2, 3, and 4 of a packet as the data link layer, network layer, and transport layer, respectively. However, these layers all have similar structures; all three have headers and data payloads and in the case of Ethernet frames a checksum is also contained in the final 4 bytes of the packet. For ease of discussion, the term packet is used to refer to all three of these structures. The term packet is not meant to be a limitation on the structure of a data unit or on the layer where the data unit exists. Also, it should be recognized that a packet can have more than three layers.

The term packet field refers to fields present in the packet header and, if present, a checksum field at the end of the packet. For example, referring to FIG. **2**, Ethernet packet **200** conforms to the IEEE Ethernet 802.3 standard and has three components: header **202**, data payload **204**, and packet checksum **206**. Packet fields of packet **200** include: destination address **208**, source address **210**, length/type **212**, and packet checksum **206**.

Additionally, packets utilizing different protocols can be layered within other packets. For example, referring to FIG. **3**, Ethernet packet **300** has header **302**, data payload **304** and checksum field **306**. Layered within Ethernet packet data payload **304** is an Internet Protocol (IP) packet that includes packet header **312** and data payload **314**. Layered within IP packet data payload **314** is a Transmission Control Protocol (TCP) packet that includes packet header **322** and data payload **324**. The TCP, IP, and Ethernet packets are associated with layers 4, 3, and 2, respectively, of the OSI Model. Packet fields of packet **300** include fields within any header **302**, **312**, or **322** and packet checksum **306**.

Referring to FIG. **4**, conventional packet slicing processes have predetermined fixed offsets **400** or **402** as the positions for slicing the packet. This process is satisfactory when packet headers are a constant size and the offset is carefully chosen to slice off only the irrelevant data payload portion of the packet. However, in a typical network, packet headers can vary in size from one packet to the next. This is due to different protocols, different options available in a single protocol, and the possibility of packets layered within data payloads. Therefore, setting a large fixed offset for slicing packet **300** at position **400** creates packet **500** of FIG. **5**. Packet **500** retains relevant headers **302**, **312**, and **322** but also retains irrelevant portion **408**, which is part of data payload **324**. On the other hand, setting the fixed offset too small, at position **402**, creates packet **600** of FIG. **6**. Packet **600** contains no irrelevant portions and retains header **302** and portion **404** of header **312**, but packet **600** is missing relevant portion **406**, which is part of header **312** and all of header **322**.

FIG. **7** depicts an exemplary process **700** for intelligently slicing packets. Initially, in step **702**, the packet is obtained. For example, the earlier discussed Ethernet packet **300** of FIG. **3** can be obtained from a port of packet switch appliance **102** of FIG. **1**.

In step **704**, one or more protocols of the obtained packet are determined. Various processes can be used for determining the one or more protocols of a packet. For example, in some networks, only one known protocol might be used. Therefore, in one exemplary embodiment, the protocol is known by default.

However, networks more commonly utilize mixed protocols. Therefore, determining the protocol of a packet by inspection is necessary. With reference to the Internet Protocol (IP), the format of IP packet headers is set forth in RFC791. According to the IP specification, layout **800** in FIG. **8** is the format of an IP packet header. The size of header can be 20-60 bytes long, depending if optional fields **802** are present. Among other information, the header contains information fields such as the length of the header **804** and header checksum **806**.

In another exemplary embodiment, the obtained packet is inspected to determine whether the packet is an IP packet. First, based on the IP specification, the packet field that should contain the header length is read. Next, based on the header length, the entire header is read. A checksum for the header is generated according to the IP specification. Finally, the generated checksum is compared to the checksum stored in the header checksum field. If the two checksums match, then the header is likely an IP header and the packet protocol is now known to be an IP packet. If the two checksums do not match, the header is unlikely an IP header, and the packet is checked for a different protocol.

While the process described above is tailored for checking for an IP packet, it should be recognized that similar processes can be used for other protocols. Examples of other protocols include Ethernet, Internetwork Packet Exchange (IPX) Protocol, TCP, Hyper Text Transfer Protocol (HTTP), and User Datagram Protocol (UDP). Processes for determining the protocol used by a packet are well known in the art. For example, Wireshark™ is a software package that is capable of identifying hundreds of different protocols based on inspecting the packet.

As discussed earlier with reference to FIG. **3**, often, multiple packets are layered inside of each other. In an exemplary embodiment, to determine the protocols in packet **300**, the packet is analyzed as a whole first. If the network uses only Ethernet packets, then the structure of packet **300** and header **302** are already known. However, if more than one standard is used on the network, then the packet header is analyzed, as described above, to look for signatures of various protocols. Once the protocol for the first packet header **302** is determined, data payload portion **304** is analyzed to determine if another packet is layered within data payload portion **304**. This is accomplished by analyzing data payload **304** in the same way as packet **300** was analyzed.

Alternatively, top-level packet **300** may contain information in header **302** regarding the type of packet that is layered within data payload portion **304**. For example, the IEEE Ethernet standard 802.3 specifies a type field that identifies the protocol of the packet layered in the data payload portion. Similarly, the IP packet header in layout **800** (FIG. **8**) specifies that the packet header contain protocol field **808** that identifies the protocol of a layered packet. Many other protocols also specify similar fields. Therefore, the presence and protocol of a layered packet might be determined from reading a packet field in the header of the lower layer packet.

Once the protocol of layered packet is determined, the process is repeated on the layered packet's data payload. In doing so, the protocol for any number of layered packets is determined.

Referring to FIG. **7** again, after the protocol(s) of the packet are determined, the position of the data payload is determined in step **706**. Once the protocol of a packet is known, the format of the packet, including the header, is also known. Based on the format of the header, the positions of the different packet fields can be determine. The position of the data payload portion can be determined based on information in the packet fields combined with information from the protocol specification.

Finally, in step **708**, a modified packet is created by removing irrelevant portions of the packet while retaining relevant portions. The modified packet may be based on a copy of the originally obtained packet. Alternatively, the modified packet is created by directly modifying the originally obtained packet. The characteristics of the modified packet are configurable by the user specifying which packet portions are relevant and irrelevant.

For example, in one exemplary embodiment, the size of the modified packet is minimized for storage while still retaining all relevant header information. What constitutes relevant information is configurable depending on what the user requests. For example, referring to FIG. **3** again, assume that only the information associated with Ethernet header **302** and checksum **306** are relevant. Modified Ethernet packet **900** in FIG. **9** is created by removing all irrelevant portions of packet **300**. Thus, modified packet **900** includes only Ethernet packet header **302** and checksum **306**.

If the modified packet is to be transmitted over the network, packet fields may need to be updated to conform to protocol specifications. Potential packet fields to update include, but are not limited to, the total packet length field and the checksum field. By updating the packet fields, modified Ethernet packet **1000** of FIG. **10** results. Modified Ethernet packet **1000** includes: modified packet header **1002**, which is packet header **302** with an updated packet length field; data payload portion **1004**, which is a 46 byte zero padded section to bring the length of the packet to the minimum of 64 bytes; and updated checksum **1006**, which is the correct checksum of the packet generated according to the Ethernet specification. Ethernet packet **1000** is suitable to retransmit over the network.

Alternatively, the user could specify that all headers related to layers 2, 3, and 4 of the OSI Model are relevant and that the modified packet is to be transmitted across the network. In this case, with reference to FIG. **11**, modified Ethernet packet **1100** resembles original Ethernet packet **300** with data payload **324** is removed. Modified packet **1100** contains packet header **1102**, headers **312** and **322**, and checksum **1106**. Packet header **1102** can be the same as packet header **302** (FIG. **3**) of the original Ethernet packet **300** (FIG. **3**). Alternatively, header **1102** can be packet header **302** (FIG. **3**) with an updated packet length field. Headers **312** and **322** are the original IP and TCP headers, respectively, of the original Ethernet packet **300** (FIG. **3**). Checksum **1106** is the correct checksum of modified packet **1100** generated according to the Ethernet specification. Ethernet packet **1100** is suitable to retransmit over the network.

Optionally, packet fields, such as packet length or header checksums, in headers **312** and **322** could be updated, which would create modified Ethernet packet **1200** of FIG. **12**. Modified packet **1200** contains: modified packet headers **1102**, which is packet header **302** with an updated packet length field; headers **1212** and **1222**, which are the modified version IP and TCP header **312** and **322**, respectively; and updated checksum **1206**, which is the correct checksum of modified packet **1200** generated according to the Ethernet specification. Ethernet packet **1200** is suitable to retransmit over the network.

In a different configuration, the obtained packet uses the Stream Control Transmission Protocol (SCTP) as specified in RFC 4960 and RFC 3286. Referring to FIG. **13**, an exemplary SCTP packet **1300** has a common header **1302** and one or more chunks. Each chunk **1304**, **1306**, **1308**, and **1310** has a header **1314**, **1316**, **1318**, and **1320**, respectively, and a data payload **1324**, **1326**, **1328**, and **1330**, respectively. The user can configure multiple different parts of the SCTP packet as relevant.

For example, if all header information and data payload portion **1328** are set as relevant, then modified packet **1400** of FIG. **14** results. The common header **1402** and chunk headers **1414**, **1416**, and **1420** are based on the original headers **1302**, **1314**, **1316**, and **1320**, respectively, with updated fields such as the length of the packet or chunk and the header or chunk checksums.

Alternatively, if only the common header **1302** is set as relevant, then modified packet **1500** of FIG. **15** results. Packet **1500** includes only unmodified common header **1302**. Also, some chunks of a SCTP packet (such as chucks **1304** and **1306**) can be kept, while other chucks (such as chucks **1308** and **1310**) are sliced because each chuck represents a unique flow.

It should be recognized that whenever SCTP packet **1300** is modified to create a modified packet, such as modified packet **1400** or **1500**, the modified packet includes an updated checksum, which is the correct checksum of the modified packet generated according to the Ethernet specification.

While the discussion of slicing a SCTP so far is in the context of a discrete SCTP packet, the SCTP packet can just as easily be layered within other packets of different protocols. For example, an SCTP packet might be layered inside of an IP packet. The IP packet might further be layer within an Ethernet packet. In this case, the Ethernet header, IP header, etc., are part of the common header.

In another exemplary embodiment, as an alternative to slicing packets, there may be a desire to have the packets retain their original size. This case arises when, for example, analysis of the network requires realistic bandwidth but there is a need for the contents of the packets to remain confidential. This type of confidentiality concern occurs in multiple circumstances such as when the data payload may contain sensitive information like bank records.

Referring to FIG. **16**, in an alternative exemplary embodiment, modified packet **1600** is created by masking the data payload **324** (FIG. **3**) of packet **300** (FIG. **3**) with data payload **1624**. By masking irrelevant portions, the packet retains it original size while still protecting the confidentially of contents of the data payload. Masking the data payload can be accomplished by overwriting it with a repeating predetermined pattern such as 0x55 or by overwriting the data payload with random data. While the length of the packet stays the same, modified packet **1600** includes a modified packet checksum **1606**, which is created by updating checksum field **306** (FIG. **3**) of the original packet with the correct checksum generated according to the Ethernet specification. Additionally, modified TCP header **1622** may be created by updating TCP packet header **322** (FIG. **3**) with the correct checksum of the new TCP packet, which includes masked data payload **1624**. Alternatively, TCP header **1622** can be the same as TCP packet header **322** (FIG. **3**).

Referring back to FIG. **1**, in an exemplary embodiment, the process steps described in process **700** (FIG. **7**) are implemented in packet switch appliance **102**. FIG. **17** depicts an embodiment of packet switch appliance **102** in detail. In the present embodiment, packet switch appliance **102** includes processor unit **1706**, network switch chip **1708**, network ports **1702** and **1704**, and instrument ports **1710** and **1712**. The steps of process **700** (FIG. **7**) can be performed by processor unit **1706** and/or network switch chip **1708**.

Referring to FIG. **18**, in an alternative embodiment of packet switch appliance **102** (FIG. **1**), daughter card **1800** is installed. Daughter card **1800** includes processor unit **1802** and network switch chip **1804**. In the present exemplary embodiment, process **700** (FIG. **7**) can be offloaded to daughter card **1800** where processor unit **1802** and/or network switch chip **1804** perform the steps of process **700** (FIG. **7**). For additional description of a packet switch appliance with a daughter card, see U.S. patent application Ser. No. 11/796,001, filed Apr. 25, 2007, which is incorporated herein by reference in its entirety for all purposes.

The foregoing descriptions of specific embodiments have been presented for purpose of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and it should be understood that many modification and variations are possible in light of the above teaching.

I claim

1. A method for processing a packet, comprising:
obtaining a packet from a network, the obtained packet having at least a packet header, one or more packet fields, and a first data payload;
determining one or more protocols used by the obtained packet;
based on the determined one or more protocols, determining a position of the first data payload; and
creating a modified packet based on the determined position of the first data payload, wherein the act of creating the modified packet comprises removing or masking the first data payload based on the determined position of the first data payload.

2. The method of claim **1**, wherein the act of creating the modified packet further comprises:
removing or masking a data payload of a second packet layered within the obtained packet while retaining one or more packet headers contained in the obtained packet relating to one or more layers of an Open Systems Interconnections Reference Model.

3. The method of claim **1**, wherein the obtained packet further has a second data payload, and wherein the act of creating the modified packet further comprises removing or masking the second data payload, the first and second data payloads being non-contiguous.

4. The method of claim **1**, further comprising:
after creating the modified packet, transmitting the modified packet over the network.

5. The method of claim **4**, wherein the act of creating the modified packet comprises:
updating one or more packet fields.

6. The method of claim **5**, wherein the act of updating the one or more packet fields comprises:
updating a checksum field.

7. The method of claim **1**, wherein the modified packet comprises a payload, at least a portion of the payload of the modified packet being different from the payload of the packet obtained from the network.

8. A program product having a non-transitory medium storing a program, an execution of which by a processor causes a process to be performed, the program comprising instructions to:

obtain a packet from a network, the obtained packet having at least a packet header, one or more packet fields, and a first data payload;
determine one or more protocols used by the obtained packet;
based on the determined one or more protocols, determine a position of the first data payload; and
create a modified packet based on the determined position of the first data payload;
wherein the instructions to create the modified packet comprises removing or masking the first data payload based on the determined position of the first data payload.

9. The product of claim **8**, wherein the instructions to create the modified packet further comprise instructions to:
remove or mask a data payload of a second packet layered within the obtained packet while retaining one or more packet headers contained in the obtained packet relating to one or more layers of the Open Systems Interconnections Reference Model.

10. The product of claim **8**, wherein the obtained packet further has a second data payload and the instructions to create the modified packet further comprise instructions to:
remove or mask the second data payload, the first and second data payloads being non-contiguous.

11. The product of claim **8**, further comprising instructions to:
transmit the modified packet over the network.

12. The product of claim **11**, wherein the instructions to create the modified packet comprise instructions to:
update one or more packet fields.

13. The product of claim **12**, wherein the instructions to update the one or more packet fields comprise instructions to:
update a checksum field.

14. The product of claim **8**, wherein the modified packet comprises a payload, at least a portion of the payload of the modified packet being different from the payload of the packet obtained from the network.

15. A packet switch appliance configured to be connected to a network, the packet switch appliance comprising:
a plurality of network ports for packet reception from the network;
a plurality of instrument ports for packet transmission to instruments; and
a processor coupled to the network ports and the instrument ports;
wherein the processor is configured to:
obtain a packet from the network through one of the network ports, the obtained packet having at least a packet header, one or more packet fields, and a first data payload,
determine one or more protocols used by the obtained packet,
based on the determined one or more protocols, determine a position of the first data payload, and
create a modified packet based on the determined position of the first data payload;
wherein processor is configured to create the modified packet by removing or masking the first data payload based on the determined position of the first data payload.

16. The packet switch appliance of claim **15**, wherein processor is configured to create the modified packet further by:
removing or masking a data payload of a second packet layered within the obtained packet while retaining one or more packet headers contained in the obtained packet relating to one or more layers of an Open Systems Interconnections Reference Model.

17. The packet switch appliance of claim **15**, wherein the obtained packet further has a second data payload, and wherein the processor is configured to create the modified packet further by removing or masking the second data payload, the first and second data payloads being non-contiguous.

18. The packet switch appliance of claim **15**, wherein the processor comprises a first processor unit.

19. The packet switch appliance of claim **18**, wherein the processor further comprises a second processor unit.

20. The packet switch appliance of claim **19**, wherein the second processor unit is a part of a daughter card.

21. The packet switch appliance of claim **18**, wherein the processor further comprises a network switch chip.

22. The packet switch appliance of claim **15**, wherein one of the instruments has network monitoring capability, and the packet switch appliance is configured to communicate with the one of the instrument through one of the instrument ports.

23. The packet switch appliance of claim **15**, wherein the processor is also configured to:

after creating the modified packet, pass the modified packet for transmission of the modified packet over the network.

24. The packet switch appliance of claim **23**, wherein the processor is configured to create the modified packet by:

updating one or more packet fields.

25. The packet switch appliance of claim **24**, wherein the processor is configured to update the one or more packet fields by:

updating a checksum field.

26. The packet switch appliance of claim **15**, wherein the modified packet comprises a payload, at least a portion of the payload of the modified packet being different from the payload of the packet obtained from the network.

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